State of Illinois
Department of Registration and Education
STATE GEOLOGICAL SURVEY DIVISION
John C. Frye, Chief

GUIDE LEAFLET

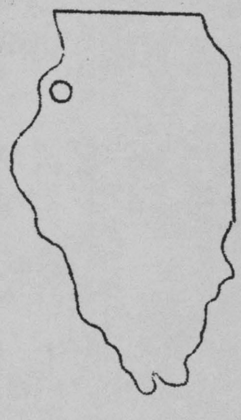
GEOLOGICAL SCIENCE FIELD TRIP

Sponsored by
ILLINOIS STATE GEOLOGICAL SURVEY, URBANA

COLCHESTER AREA

McDonough and Adams Counties

Macomb, Colchester and Carthage Quadrangles



Leaders
Edgar Odom, George M. Wilson, Guy Dow, David Reinertsen
Urbana, Illinois
May 2, 1964

GUIDE LEAFLET 1964B

HOST: Colchester High School

COLCHESTER GEOLOGICAL SCIENCE FIELD TRIP

Itinerary

0.0	0.0	Assemble on south side of Colchester Grade School and Junior High School heading east. Turn left and proceed north to business district.
0.2	0.2	CAUTION. Railroad crossing, C,B, & Q. Colchester business district.
0.1	0.3	Turn right (east).
0.0	0.3	STOP. Rt. 136. Continue east.
0.6	0.9	Turn left (north).
0.1	1.0	Abandoned coal-mine shaft on left.
0.3	1.3	Abandoned mine gob pile on left.
0.5	1.8	T-road. Continue ahead.
0.2	2.0	An example of the decorative use of geodes on the left. An abandoned coal mine shaft north of the house.
0.5	2.5	Note shale and clay outcropping on right and left.
0.3	2.8	Bridge over east fork of La Moine River. Turn right immediately after bridge.
0.5	3.3	Sandstone, clay and coal in ditch on right.
0.1	3.4	T-road. Turn right.
0.3	3.7	Abandoned drift mine in small valley on right.
0.2	3.9	Abandoned drift mine on west side of valley to right.
0.1	4.0	Note slumping (mass wasting) on right.
0.4	4.4	Bridge over Spring Creek.
0.5	4.9	Note dark reddish loess on left.
0.1	5.0	Turn sharp left. Look for oncoming traffic.
1.0	6.0	Turn left. Continue on blacktop road.
0.4	6.4	Stop 1. Sand and silt below Illinoian till.

At the top of the deep road cut can be seen about 10 feet of Illinoian glacial till. At a lower elevation below the till is about 35 feet of stratified sand and silt. The stratification in the sand and silt indicates they were deposited by running water. The cross-stratification present in several zones also indicates stream action.

After the sand and silt were deposited, they were overridden by the Illinoian glacier which deposited the till. Although the sand and silt might have been deposited as the Kansan glacier retreated, the lack of a weathered zone on the top of the sand and silt supports the interpretation that these deposits were laid down in front of the advancing Illinoian glacier and are Pro-Illinoian.

Many thousands of years ago much of northern North America was covered by huge glaciers. These glaciers, which advanced from centers in central and eastern Canada, developed when the mean annual temperatures were somewhat lower than they are now and not all of the snow that fell during the winters melted during the summers. After many years a sheet of ice formed that was so thick its weight caused it to flow outward, carrying with it the soil and rocks on which it rested and over which it moved.

The "Ice Age" (Pleistocene is the scientific name) began about one million years ago and ended about five thousand years ago. There were four major periods of glaciation during this age. Between each glacial period was a long interglacial period in which conditions were much as they are today.

The oldest glacier is named Nebraskan because typical glacial deposits are best developed in the state of Nebraska. Nebraskan deposits are not abundant in Illinois, probably because weathering destroyed them during the Aftonian Interglacial Stage which followed the retreat of the Nebraskan glacier.

The next glacial climate produced the Kansan glacier. Thick deposits of fine rock materials and outwash sand and gravel were deposited in Illinois when this glacier melted away.

The Kansan Stage was followed by the Yarmouthian Interglacial Stage, during which erosion carved valleys and hills, and soils were formed in the Kansan deposits.

The third glacial stage, the Illinoian, is important to the residents of Illinois. It covered 80 percent of the state, reaching southward to Carbondale and Harrisburg.

After several thousands of years, a warm stage caused the Illinoian ice sheet to melt and retreat. During this stage, the upper part of the rock materials left by the glacier weathered and soil developed, as in the preceding Yarmouthian interval. These ancient soils resemble present-day soils in color, texture, and depth. These similarities suggest that the climate during interglacial times was similar to our present climate.

The last and most recent glacial stage was the Wisconsinan. The Wisconsinan consisted of two major glacial advances--the Altonian and later the Woodfordian. Little is known about the extent of the Altonian glacier, as its deposits were overridden by later glaciers except in northern Illinois. The Woodfordian glacier advanced southward from the Lake Michigan basin to the present sites of Shelbyville, Charleston, and Peoria, where it formed a terminal moraine called the Shelbyville Moraine. The Shelbyville Moraine was formed approximately 20,000 years ago.

As the Wisconsinan glacier retreated, the ice withdrawals and readvances created a complex sequence of deposits in northeastern Illinois, the most outstanding of which are the moraines. More than 30 successive moraines were formed by the Wisconsinan glacier in Illinois alone.

When the glaciers melted, they released rock materials that they had picked up as they advanced. Some of the glacial drift was washed out with the melt waters, but some of it was deposited in place as the ice melted. This material consists of a mixture of all kinds and sizes of rock fragments and is known as <u>till</u>. The coarsest outwash material was deposited nearest the ice front and the finer material farther away. The finest clay may have been carried all the way to the ocean. Where the outwash material was spread widely along the front of the glacier, it formed an <u>outwash plain</u>. Where the outwash was concentrated along stream valleys, it formed <u>valley train deposits</u>.

A <u>moraine</u> represents the accumulation of drift at the ice margin while the rate of advance and the rate of melting of the glacier were essentially in balance. As more and more material was brought to the edge of the static glacier, it was piled up at the front to form a ridge or moraine.

The surface relief of moraines is generally greater than that of the surrounding area and is referred to as <u>swell-and-swale</u> or <u>knob-and-kettle</u> topography. Generally the outer slope and edge of moraines is interrupted by valleys and re-entrant angles marking the courses of glacial streams. At some places there are large gaps in the moraines where subglacial streams presumably carried away most of the drift.

At times, especially in the fall and winter, the outwash plains and valley trains were exposed when the melt waters subsided; the wind picked up silt and fine sand from their surfaces, blew it across the country and dropped it to form deposits of <u>loess</u>. Glacial loess mantles most of Illinois. Near the large river valleys it may be as much as 60 to 80 feet thick. Far from the valleys it may measure only inches, if it can be identified at all.

The importance of the Pleistocene Epoch is emphasized by the rich soils formed from the glacial deposits and by the abundant deposits of sand and gravel. The state would not have these valuable resources if the glaciers had missed Illinois.

1.7 8.1 Crossroad. Continue ahead. End of blacktop road.

0.6 8.7 Turn right (north).

0.6 9.3 Turn left (west).

0.4 9.7 Turn left (south).

0.1 9.8 Turn right (west).

0.3 10.1 Note the extensiveness and flatness of the upland surface.

0.7 10.8 Turn left (south).

2.1 12.9 T-road west. Continue ahead.

0.5 13.4 Turn left (east).

0.2 13.6 Entrance to Argyle Lake State Park.

0.5 14.1 Clay pits can be seen on the right and left.

0.2 14.3 Crossing east branch of the La Moine River.

0.5 14.8 Stop 2. Colchester Brick and Tile Plant.

The thick claystones and shales below the Colchester Coal are the basis for a prosperous ceramic and structural clay products industry. Brick of many colors and shades can be manufactured from these claystones and shales because of the variation in mineral content. Light colored bricks are obtained from the claystones and shales with a high content of the clay mineral kaolinite. Red bricks are made from material with a high content of the clay mineral illite. By mixing the materials containing these two clay minerals, various shades between red and white are produced.

The clay pit east of the plant shows the following succession of Pennsylvanian strata beginning at the top.

Carbondale Formation	
Francis Creek Shale, gray	15'0"
Colchester (No. 2) Coal	2'4"
Spoon Formation	
Underclay, white, calcareous	4'0"
Shale, drab, sandy; contains a few flat concretions of ferruginous, sandy limestone in lower half	8'0"
Shale, blue and yellow, sandy at top	12'0"
Shale, white, has carbonaceous streaks near base	5'0"
Sandstone, argillaceous, compact	1'0"
Potters clay, gray to blue; has carbonaceous streaks near top	10'0"
Sandstone, yellowish to bright red, thin-bedded	5'0"

Practically all of the beds in the above section (quoted from Hinds, 1910), except the coal and some of the sandstone, are usable for the manufacture of structural clay products. The potters clay burns to a light cream color, whereas a mixture of some of the higher shales results in various red shades of brick and tile. A great asset to operations at this place is the virtual lack of overburden above the productive formations; even the covering of loess at the top of the cut can be used for some ceramic purposes.

0.7 15.5 STOP. Turn right (west) on Rt. 136.

0.5 16.0 SLOW. Turn right on blacktop road at west edge of Colchester.

0.6 16.6 Spoil piles of abandoned mines on right and left.

0.9 17.5 Bridge over east fork of La Moine River.

0.2 17.7 Quarry in Mississippian Salem and St. Louis Limestones.

0.4 18.1 Stop 3. Mississippian Limestone and Overlying Pennsylvanian Strata.

In the quarry at the base of the hill is a dense limestone (limestone conglomerate and breccia) belonging to the St. Louis Formation. This limestone is overlain by clay, shale, coal, and sandstone of the Pennsylvanian System. Near the top of the hill a thick section of Pennsylvanian strata is exposed. The following is a generalized section at the north wall of the quarry.

	approximate thickness
Pleistocene Loess and Glacial Till	2--5 feet
Pennsylvanian System	
Carbondale Formation	
Pleasantview Sandstone (Channel)	15 feet
Francis Creek Shale	1--2 feet
Colchester (No. 2) Coal	2--3 feet
Spoon Formation	
Underclay	3 feet
Claystone	2 feet
Shale	3 feet
Claystone	2 feet
Seahorne Limestone	2 feet
Claystone	6 feet
Shale	10 feet
Sandstone	6 inches
Claystone with coaly streaks	3 feet
Sandstone	1 foot
Claystone and shale	4 feet
Rock Island (No. 1) Coal	2--18 inches
Sandstone	1 foot
Claystone (sandy)	4 feet
Mississippian System	
Limestone	

Several coals appear in the section, but only the Colchester and the Rock Island Coals reach minable thickness in this area. The Colchester Coal was mined extensively in the area in past years. The Rock Island Coal has been mined only in a few localities. The Colchester is consistently two or more feet thick while the Rock Island varies from zero to about three feet in thickness. The Rock Island Coal occurs in linear channel type deposits. Because of the channel type occurrence, coal may be two or more feet thick in a small area, while only a few hundred yards away there may be no coal at all.

The claystones and shales below the Colchester Coal were mined here for ceramic purposes. A large number of mines, active and abandoned, occur in this area.

The Pennsylvanian Period

Pennsylvanian sediments consist of many different rock types, with coal the most outstanding. In Illinois, coals are commonly overlain by black sheety shale (roof slate) followed by limestone with marine fossils. The limestone is usually overlain by gray shale also containing marine fossils. Beneath the coal is an underclay, in turn sometimes underlain by limestone or shale, then sandstone.

This type of rhythmic succession of different kinds of strata is repeated in much the same sequence some 50 times where the Pennsylvanian rocks are thickest. Each rhythmic succession of Pennsylvanian rocks is called a cyclothem. An attached sheet shows an ideally complete cyclothem, but all the units are seldom present.

The thickness of the Pennsylvanian System and of the individual cyclothems varies greatly from place to place. An example of this is the interval between the Colchester (No. 2) Coal and the base of the Pennsylvanian. The interval averages about 125 feet in western Illinois, while in the southeastern part of the state this section of the Pennsylvanian column is represented by about 1,200 feet of strata. Although deposition started relatively early in Pennsylvanian time in western Illinois, it either proceeded very slowly or was interrupted frequently by intervals when no sediments were deposited.

The many different rock types in the Pennsylvanian System indicate rapid changes of environment which took place repeatedly. At that time rivers were bringing sediments from the north and east, possibly as far as the present Atlantic coast and the region south of Hudson Bay. The Midwest was a low, flat, swampy area lying just a little above sea level but subjected to frequent marine invasions as the land or the sea level rose or sank. That these conditions existed is evident from the nature of the sediments. Many of the shales, limestones, and ironstones above the coals contain marine fossils. The coals are believed to have formed in broad, freshwater marshes somewhat like the present Dismal Swamp of Virginia. Most of the sandstones, conglomerates, underclays, underclay limestones, and some shales probably accumulated in freshwater environments such as river valleys, lagoons, lakes, or lowland plains. There is no area in the world today that has conditions exactly like those that existed during "Coal Measures" time.

The plants and trees that grew in the Pennsylvanian were very luxuriant. In the jungle-like growths, the most common plants were huge tree ferns that had fronds five or six feet long and grew to a height of more than 50 feet. Along with them were seed ferns, now extinct; giant scouring rushes; and large scale trees, which grew to heights of 100 feet or more.

The large trees preserved in coals do not have growth rings. The luxuriant growth and lack of growth rings probably indicate that the climate that prevailed at this time was warm and without seasonal change. As the plants fell into the swampy waters, they were partially preserved, buried by later sediments, and converted into coal.

0.6 18.7 Turn right (north).

1.0 19.7 Turn right (east)

0.9 20.6 Sandstone and shale outcrops in ravine on right and left.

0.6 21.2 Sandstone outcrops in ravine on right and left.

0.1 21.3 Turn right (south).

0.7 22.0 Turn left to Argyle Lake State Park.

0.4 22.4 LUNCH. (Stop 4.)

0.3 22.7 Return to Colchester Road.

0.8 23.5 Colchester Road. Turn right.

0.3 23.8 Turn right.

0.4 24.2 Turn left (west).

1.6 25.8 STOP. Turn left (south).

1.6 27.4 Limestone quarry on left is in St. Louis Formation.

0.6 28.0 East fork of La Moine River.

0.1 28.1 Outcrop of Pennsylvanian shales, coals, sandstones. This is a sequence observed at Stop 3.

0.3 28.4 Crossroad. Continue ahead.

0.5 28.9 Entering Tennessee.

0.2 29.1 STOP. Turn right on Rt. 136.

2.4 31.5 Junction Rts. 136 and 61. Turn left on Rt. 61.

1.5 33.0 Rattlesnake Den Hollow. Note lower Pennsylvanian sandstone.

0.6 33.6 Note prominent ridge ahead. (Check glacial boundary on map.)

1.6 35.2 Oil gathering facilities on right.

0.7 35.9 Entering Colmar.

0.5 36.4 Wooden oil storage tanks and steel tanks on left.

0.1 36.5 Northern part of the Colmar-Plymouth Oil Field. Note wagon-mounted drilling rig on left.

0.8 37.3 Crossing the La Moine River. Oil collection and water separation center on left.

0.8 38.1 Oil wells on right and left.

0.3 38.4 Stop 5. Colmar-Plymouth Oil Pools.

From here many of the wells, gathering lines, and gathering tanks of the Colmar-Plymouth oil field can be seen. The discovery well of the Colmar pool was completed on the J. Hoing farm about 2 miles NE of here on April 30, 1914. Original production was 40 barrels a day from a sand, subsequently called the Hoing Sandstone, at a depth of 417 feet. The Plymouth discovery well was the No. 1 Roberts, completed in early 1915 about 2½ miles southwest of the Colmar pool. This well produced from the Hoing at the rate of 45 barrels per day.

Most of the more than 500 producing wells were completed by the end of 1916 which explains the vintage equipment displayed here. Approximately 225 wells are still producing at the average rate of three-fourths of a barrel per day. Forty-eight thousand barrels were produced in 1962, and 4,413,000 barrels have been produced since its discovery date through 1962. The deepest test was to the Shakopee at a depth of 1,095 feet. The oil is of high gravity (38°), green in color, and non-acid (sweet).

An air injection system begun in 1934 successfully increased production and is still in operation. Waterflooding, using unfiltered, untreated water from the Burlington-Keokuk Formations, was tried in 1943. Production initially increased but after a short time fell off sharply and the operation was discontinued. Impurities and bacteria in the injected water probably were sealing off the permeable oil sand.

In this area, middle Devonian carbonates and sandstones of the Cedar Valley Formation rest unconformably on the Maquoketa Shale of Ordovician age. The Cedar Valley is 20 to 55 feet thick in the oil field but pinches out only 3 miles to the south. The upper 15 to 25 feet is gray, sandy, dolomitic limestone. Beneath this the Hoing Sandstone member may occur with an average thickness of 12 feet.

The two pools occur in separate lenses of the Hoing Sandstone. The Plymouth lens is 160 feet above sea level on an east to southeast trending anticline. The Colmar lens is 90 feet above sea level on a terrace to the northeast. Thicknesses of the Hoing range from 4 to 22 feet in the Plymouth lens and from 7 to 26 feet in the Colmar lens. Both lenses reach maximum thickness along their north and northwest margins. The fact that salt water occurs beneath the oil on the anticline 40 to 70 feet higher than on the terrace proves that they are two separate lenses.

1.5 39.9 SLOW. Continue ahead on Rt. 61.

0.5 40.4 Entering Plymouth.

0.4 40.8 Curve. Continue ahead to Plymouth business district. CAUTION. Railroad tracks.

0.2 41.0 Go right, around the square and turn north on blacktop road.

0.5 41.5 SLOW. Turn left (west).

1.1 42.6 Note loess and till overlying bedrock and cuts on right and left.

0.5 43.1 Bronson Creek. Abandoned quarry on left.

0.5 43.6 Abandoned quarry in Warsaw and Keokuk Limestone on left.

0.9 44.5 Turn left (west).

1.0 46.5 Turn left (south).

0.2 46.7 Bronson Creek.

0.1	46.8	Loess exposed in cut on right and left.
0.4	47.2	SLOW. Turn right (west).
0.8	48.0	Turn right. Bridge over Panther Creek to left.
0.2	48.2	Warsaw Shale and Limestone outcrops in ditch on left.
0.1	48.3	Salem and St. Louis Limestones on right.
0.1	48.4	T-road north. Continue ahead.
0.8	49.2	Jog right, then left.
0.4	49.6	T-road west. Continue ahead (south).
0.5	50.1	Turn right.
0.0	50.1	Limestone outcrops in ravine on left.
0.2	50.3	Turn left (south). Salem and St. Louis Limestones in ravine.
0.2	50.5	Turn right. Follow gravel road.
0.3	50.8	Turn left (south).
0.8	51.6	T-road. Turn left (east). This is the Plymouth road.
0.7	52.3	Stop 6. Panther Creek Quarry in the Salem and St. Louis Limestones.

This quarry provides an excellent exposure of the conglomeratic, brecciated, shaly St. Louis Limestone and several feet of the underlying sandy and dolomitic Salem Limestone. The St. Louis Limestone is very contorted and disturbed. Some beds are conglomeratic with rounded limestone pebbles. Other beds are brecciated with angular limestone fragments, some of which are several inches in diameter. In general the brecciated beds overlie the conglomeratic beds. The limestone is very shaly near the base below the conglomerates and breccias.

The St. Louis Limestone was once much thicker here and overlain by still later Mississippian formations as well as a thick section of Pennsylvanian strata. Above the St. Louis is an iron-stained sandstone that probably belongs to the Pennsylvanian System. This signifies that a period of erosion occurred in this area between the deposition of the St. Louis Limestone and the deposition of sandstones during the Pennsylvanian Period.

The breccia and conglomerate in the St. Louis appear to have been formed during or soon after the deposition of the limestone. The rounded pebbles in the conglomerate may be the result of wave action soon after deposition. The breccias, most of which lie above the conglomerates, may have been caused by shattering and settling of the rock during compaction over and into the irregular masses of conglomerate and associated blue-gray shale.

A sizable tonnage of limestone has been removed from this quarry for roadstone and for agstone to sweeten the soil. Illinois ranks third in the production of agstone.

0.2 52.5 Begin blacktop road.

0.4 52.9 Excellent exposures of loess in roadcuts along newly constructed Plymouth road.

1.3 54.2 Turn left on road to Colchester Stone Company Quarry.

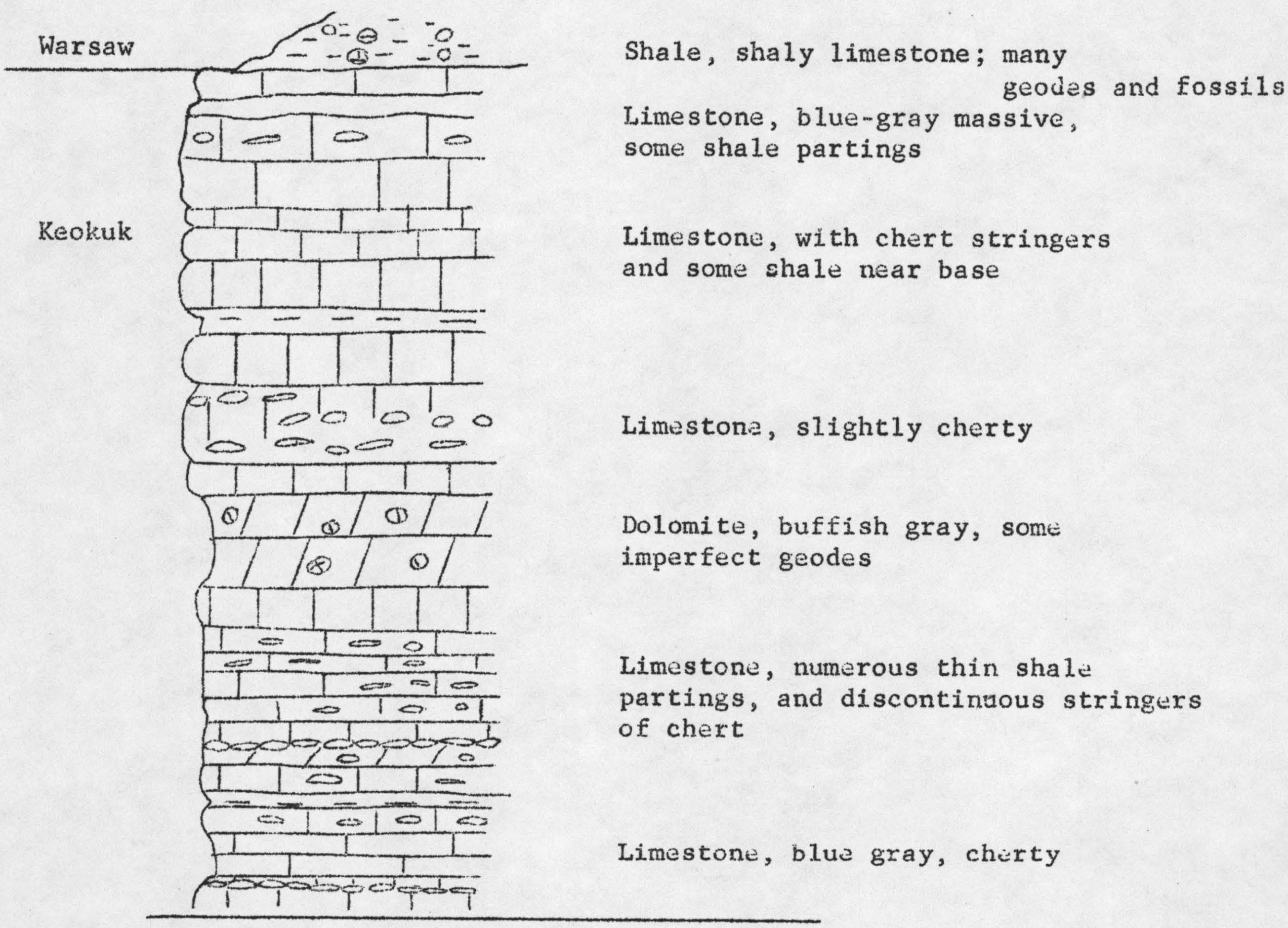
0.5 54.7 T-road west. Continue ahead.

0.5 55.2 Haulage road of the Colchester Stone Company Quarry. Turn right. Quarry is three-quarters of a mile from road.

0.7 55.9 Stop 7. Quarry in Warsaw and Keokuk Formations.

In this quarry the geode-bearing Warsaw Shale and the Keokuk Limestone are exposed. Only the lower Warsaw in which geodes and fossils are abundant is present in this quarry.

The Keokuk is characterized by massive, evenly bedded cherty limestone with thin shale beds. In some areas the limestone becomes very cherty at the base. This cherty zone, about 40 feet thick, is the Montrose Chert Member. A generalized section of the rocks in this quarry follows.



Scale 1" = 10'

Geodes are usually globular although they also may be irregular, discoid, or shaped like fossils. They usually are found in limestone, but they also may form in shaly rocks. Most of them are hollow, but many have become filled with minerals growing from the walls inward.

A typical geode sawed or broken in two will disclose a sequence of layers from the outside in as follows: 1. A thin, clay layer. 2. A layer of noncrystalline chalcedony. 3. Crystals (usually quartz) projecting into the hollow interior. Sometimes calcite or dolomite crystals will form next to the outer chalcedony layer instead of quartz, and occasionally the inside of a geode will be only chalcedony. 4. A deposit of minor minerals, commonly as drusy crystals such as pyrite, ankerite, magnetite, hematite, kaolin, aragonite, millerite, chalcopyrite, sphalerite, limonite, smithsonite, malachite, gypsum, fluorite, barite, marcasite, goethite, pyrolusite, and possibly tenorite and chalcocite. The rarest geodes contain petroleum or some thicker bituminous material.

How did geodes originate? There are many theories, none of which are completely adequate.

Geologists generally agree that geodes are cavity fillings. The agreement ends over the origin of the initial cavity. One idea is that the cavities are "vugs" caused by gas pockets or shrinkage of the rock. However, vugs are integral parts of a rock, whereas geodes are complete entities which can be broken out of the rock formation. Some have suggested that geodes are merely special types of concretions; but geodes grow from the outer shell inward, whereas concretions build up from a central core. Bassler (1908) has shown that some geodes originate in fossil cavities and as the geode grows the fossil bursts. Upon further growth, the fragments of the fossil are dissolved or absorbed by the growing geode. Van Tuyl (1916) believes that the original cavity is the space which was occupied by a concretion. Concretions could be easily removed from the rock by percolating waters and would leave a likely spot for a geode to grow. The fact that some geodes contain calcareous clay concretions supports this theory.

Pettijohn (1949) gives a rather complex process by which geodes grow. A cavity is formed in the rock. A salty solution fills the cavity and pore spaces in the rock. A layer of gelatinous silica is then deposited isolating the salt solution in the cavity. Later the water in the surrounding pore spaces becomes fresh. This sets up what is known as an osmotic cell. This particular osmotic cell consists of two different types of solutions separated by a membrane of gelatinous silica which will allow the fresh solution to pass into the geode cavity but will not allow the salt to pass out of it. The fresh water flowing into the cavity by osmosis builds up internal pressure which pushes on the walls of the geode. Exerted outward against the surrounding limestone, this pressure dissolves the limestone leaving an insoluble residue which becomes the thin clay layer on the outer surface of the geode. The above process continues until the salt solution is so diluted by the incoming fresh water that the osmotic cell no longer operates. The geode has reached maturity. Gradually the silica gel dehydrates and crystallizes. Shrinking and cracking follow. Finally, mineral bearing waters flowing through the cracks deposit the innermost layer of minerals. These cracks eventually may seal, leaving a completely closed geode.

-end of trip-

GEOLOGICAL HISTORY OF COLCHESTER AREA

The geological story of the Colchester region falls naturally into four chapters:

1. The formation and beveling of the crystalline basement.
2. The formation of the bedrock layers.
3. The "lost interval" of erosion.
4. The Ice Age history.

The crystalline or "granite" basement on which the bedrock layers were laid down comes to the surface in the St. Francis Mountains of Missouri and in the region surrounding Lake Superior. In Illinois only a half dozen wells have penetrated to the granite.

Some of the basement rocks were once sandstone or shale; others cooled from a molten state deep underground under great pressure or as they poured out upon the surface as lava. These ancient rock masses then were twisted and shattered in great mountain-making movements deep in the earth's crust. Finally erosion, working through an immense span of geologic time, wore the mountains down to a nearly flat plain.

The formation of the basement foundation consumed three-fourths of all geological time during the two eras (Archaeozoic and Proterozoic) classed together as "Precambrian."

The Cambrian sea was the first to bring preservable types of life to the region and marks the beginning of a long period of time (the Paleozoic Era) when Illinois was beneath the waters of seas that invaded the continent's interior. During this era layers of bedrock limestone, shale, and sandstone were laid down as sediment on the bottom of the sea. Late in the Paleozoic Era, during the Pennsylvanian Period, layers of coal were formed presumably in great swamps near sea level. The coal-bearing strata once extended across the entire region but were partially worn away during the long period of erosion that marks the "lost interval" in Illinois.

After the Coal Period, over 200 million years ago, the seas withdrew, and there is no evidence that they again covered this part of Illinois. Instead, the region was raised a moderate distance above sea level, and streams and weathering agencies stripped away the rocks, layer by layer. The debris of this erosion process was carried off to lower regions to be deposited as new sediments that would some day harden into rock strata. Thus through the days of the dinosaurs and of all the primitive mammals that followed them, no record exists of the nature of life in Illinois. Geologists only know that erosion laid bare the Mississippian limestones and shale that once were buried beneath the coal strata and that streams cut deep valleys into the bedrock.

About a million years ago, climatic conditions permitted the accumulation of great ice masses at the poles and caused them to move as continental glaciers down into our present temperate zone. Climate during the ice age fluctuated so that mild intervals of hundreds of years in duration intervened between stages of glacial advance.

The Pleistocene or Ice Age is divided into four major glacial advances, the Nebraskan, Kansan, Illinoian, and Wisconsinan. Of these, only the middle two are known to have crossed the region and the first is presumed to have crossed. The last glaciation did not extend this far south-east, but the waters from its melting effected the Mississippi River which indirectly contributed the loess that is so vital a factor in the fertility of the uplands.

SUGGESTED REFERENCES

Bassler, R. S., 1908, The Formation of Geodes, with Remarks on the Silicification of Fossils: National Museum Proc., Vol. 35.

* Bell, A. H., Van Den Berg, J., Whiting, L. L., Sherman, C. W., and Mast, R. F., 1963, Petroleum Industry in Illinois, 1962: Illinois Petroleum 77, 112 p.

Hinds, Henry, 1919, Colchester-Macomb: U. S. Geol. Survey Atlas, Folio 208.

*Horberg, Leland, 1950, Bedrock Topography of Illinois: Illinois Geol. Survey Bull. 73, 111 p.

Howard, R. H., 1961, Oil and Gas in the Adams-Brown-Schuyler County Area, Illinois: Illinois Geol. Survey Circ. 325, 23 p.

Pettijohn, F. J., 1949, Sedimentary Rocks: Harper, New York, 526 p.

Van Tuyl, F. M., 1916, The Geodes of the Keokuk Beds: Am. Jour. Sci., Fourth Series, Vol. 42.

White, W. A., 1963, Buff-Burning Clay Resources of Western Illinois: Illinois Geol. Survey Circ. 353, 23 p.

* out of print

GENERALIZED GEOLOGIC COLUMN
FOR THE COLCHESTER AREA
Prepared by the Illinois State Geological Survey

ERA		SYSTEM	SERIES	FORMATIONS AND REMARKS
Cenozoic	Recent Life	Quaternary	Pleistocene	Recent post-glacial stage Wisconsinan glacial stage Sangamon interglacial stage Illinoian glacial stage Yarmouthian interglacial stage Kansan glacial stage Aftonian interglacial stage Nebraskan glacial stage
		Tertiary	Pliocene	"Lafayette" stream gravels
Mesozoic	Middle Life	Cretaceous		Present in extreme southern and western Illinois
		Jurassic		Not present in Illinois
		Triassic		Not present in Illinois
Paleozoic	Ancient Life	Permian		Not present in Illinois
		Pennsylvanian		Carbondale, Spoon and Abbott Formations Sandstones, siltstones, shales, clays, and coal beds
		Mississippian	Valmeyeran	St. Louis Limestone Salem Limestone & Dolomite Warsaw Shale and Limestone Keokuk Limestone
		Devonian		Limestone and sandstone in deep wells
		Silurian		Not present in Colchester area
		Ordovician		Shales, limestone, and sandstones, in deep wells
		Cambrian		Dolomites in deep wells

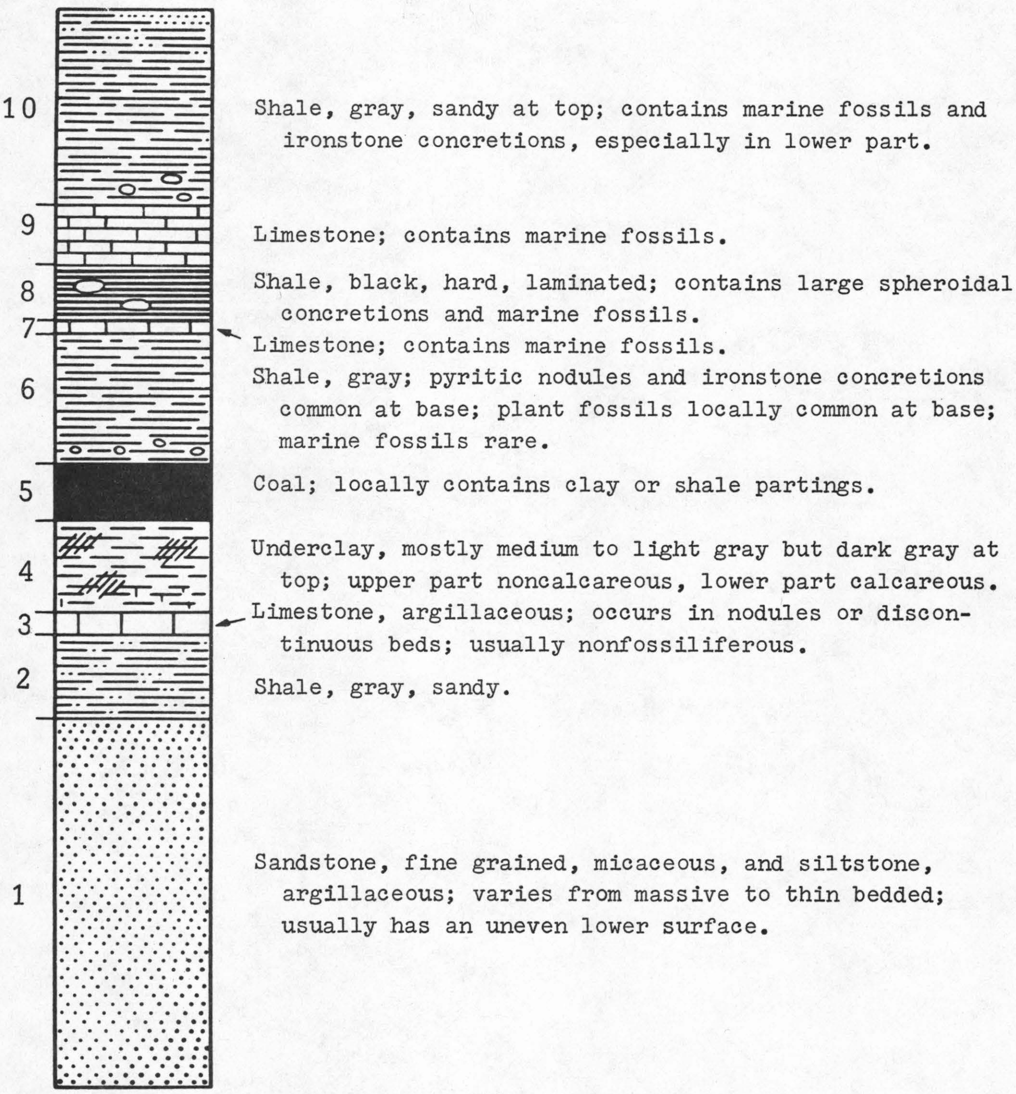
Proterozoic
Archeozoic

} Referred to as "Precambrian" time

TIME TABLE OF PLEISTOCENE GLACIATION

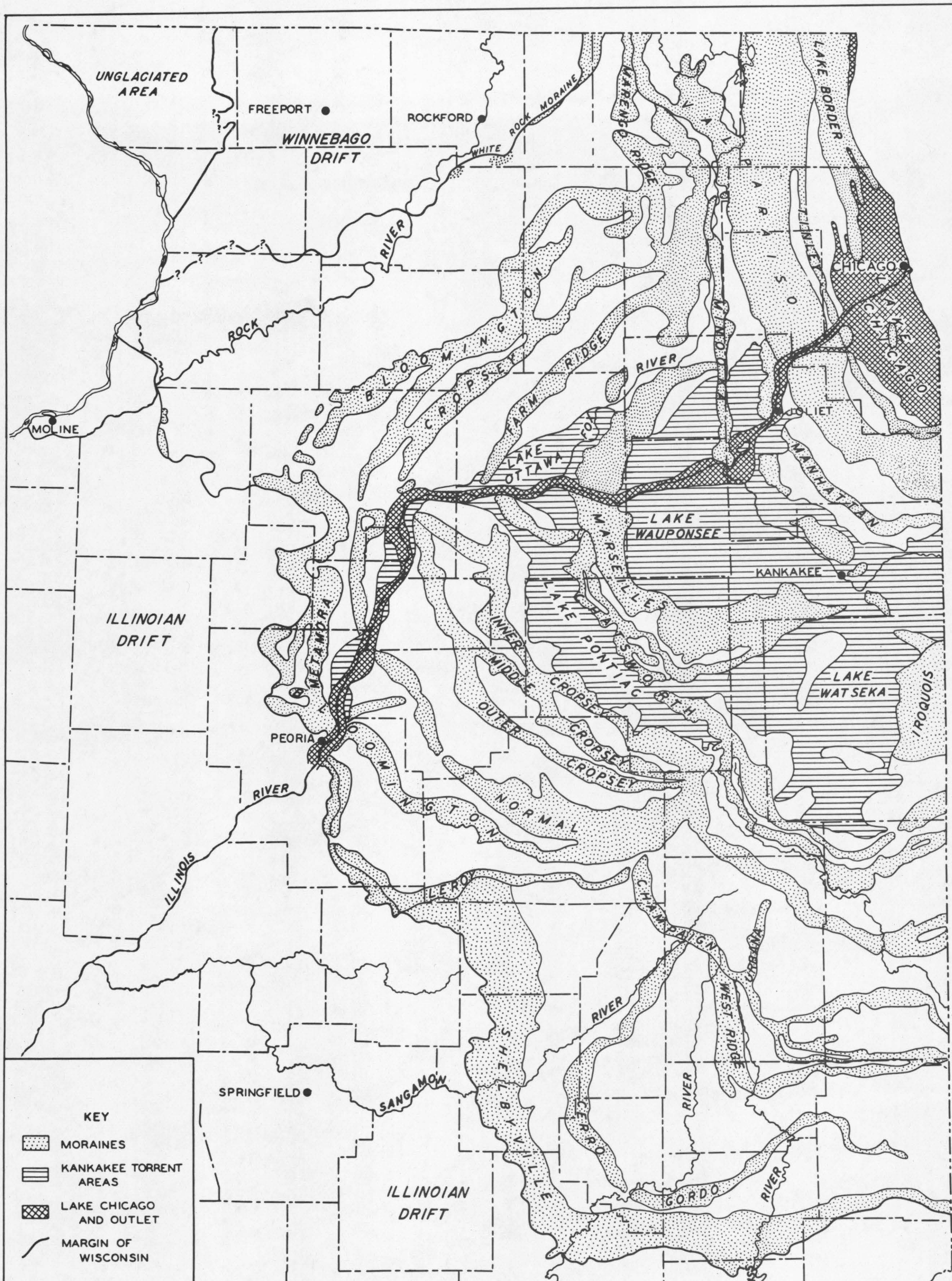
STAGE	SUBSTAGE	NATURE OF DEPOSITS	SPECIAL FEATURES
HOLOCENE	Years Before Present	Soil, youthful profile of weathering, lake and river deposits, dunes, peat	
	7,000		
WISCONSINAN (4th glacial)	Valderan	Outwash, lake deposits	Outwash along Mississippi Valley
	11,000		
	Twocreekan	Peat and alluvium	Ice withdrawal, erosion
	12,500		
	Woodfordian	Drift, loess, dunes, lake deposits	Glaciation; building of many moraines as far south as Shelbyville; extensive valley trains, outwash plains, and lakes
	20,000		
	Farmdalian	Soil, silt, and peat	Ice withdrawal, weathering, and erosion
	28,000		
	Altonian	Drift, loess	Glaciation in northern Illinois, valley trains along major rivers
	75,000		
SANGAMONIAN (3rd interglacial)		Soil, mature profile of weathering	
	200,000		
ILLINOIAN (3rd glacial)	Jubileean	Drift, loess	Glaciers from northeast at maximum reached Mississippi River and nearly to southern tip of Illinois
	Monican	Drift, loess	
	Liman	Drift, loess	
	250,000		
YARMOUTHIAN (2nd interglacial)		Soil, mature profile of weathering	
	600,000		
KANSAN (2nd glacial)		Drift, loess	Glaciers from northeast and northwest covered much of state
	700,000		
AFTONIAN (1st interglacial)		Soil, mature profile of weathering	
	900,000		
NEBRASKAN (1st glacial)		Drift	Glaciers from northwest invaded western Illinois
	1,000,000		

(Illinois State Geological Survey, 1971)



AN IDEALLY COMPLETE CYCLOTHEM

(Reprinted from Fig. 42, Bulletin No. 66, Geology and Mineral Resources of the Marseilles, Ottawa, and Streator Quadrangles, by H. B. Willman and J. Norman Payne)



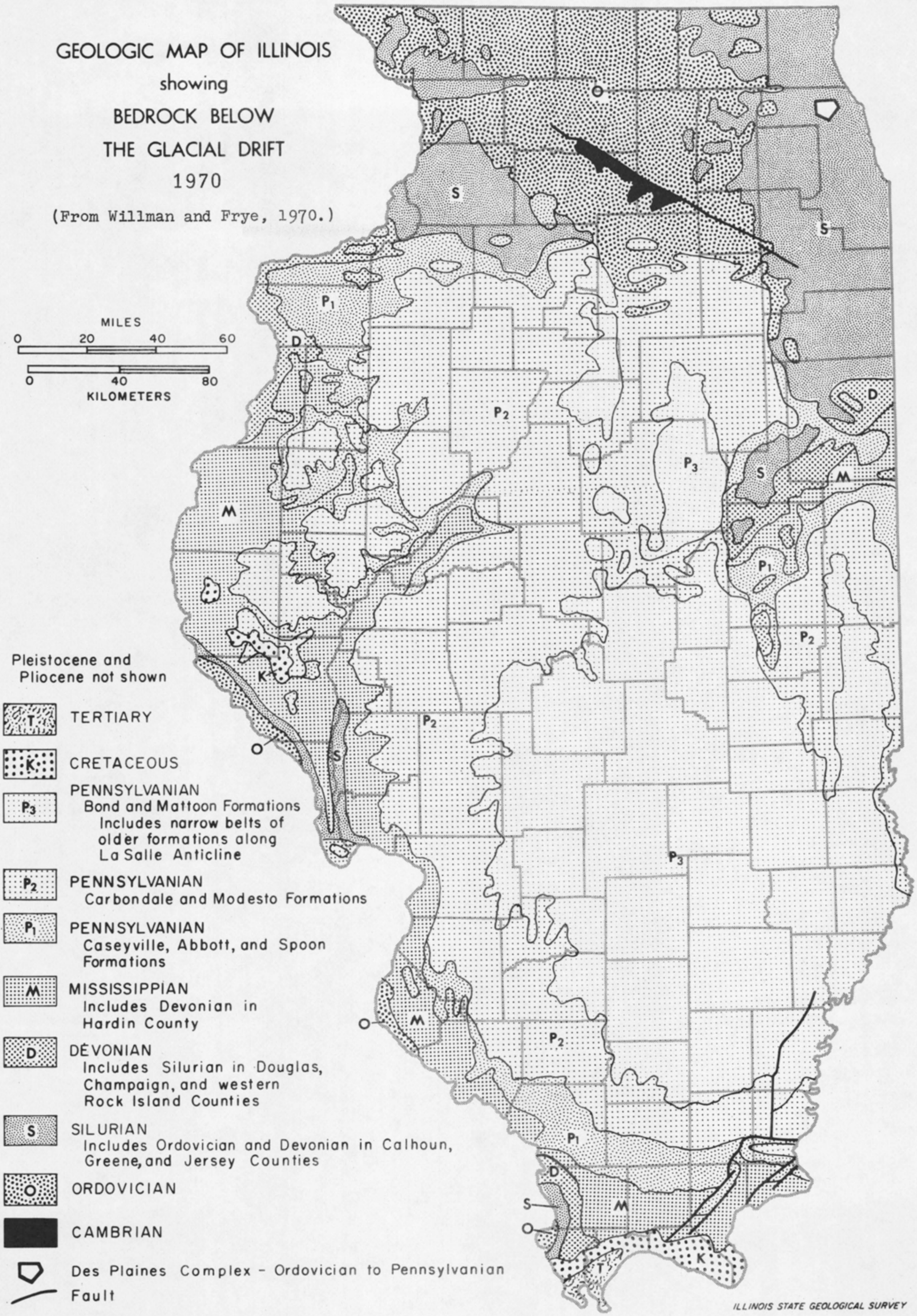
GLACIAL MAP OF NORTHEASTERN ILLINOIS

George Ekblaw

Revised 1960

GEOLOGIC MAP OF ILLINOIS
showing
BEDROCK BELOW
THE GLACIAL DRIFT
1970

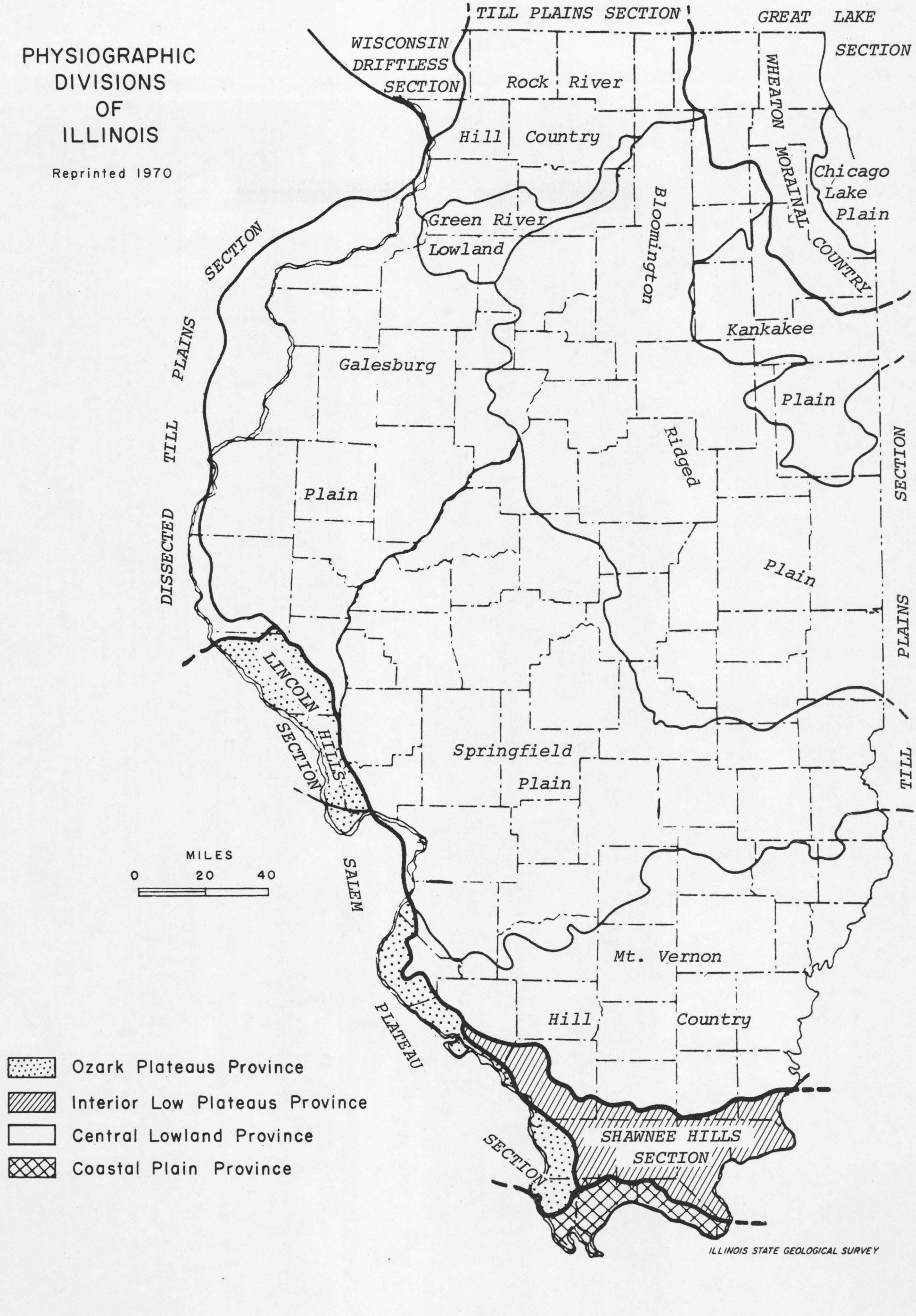
(From Willman and Frye, 1970.)

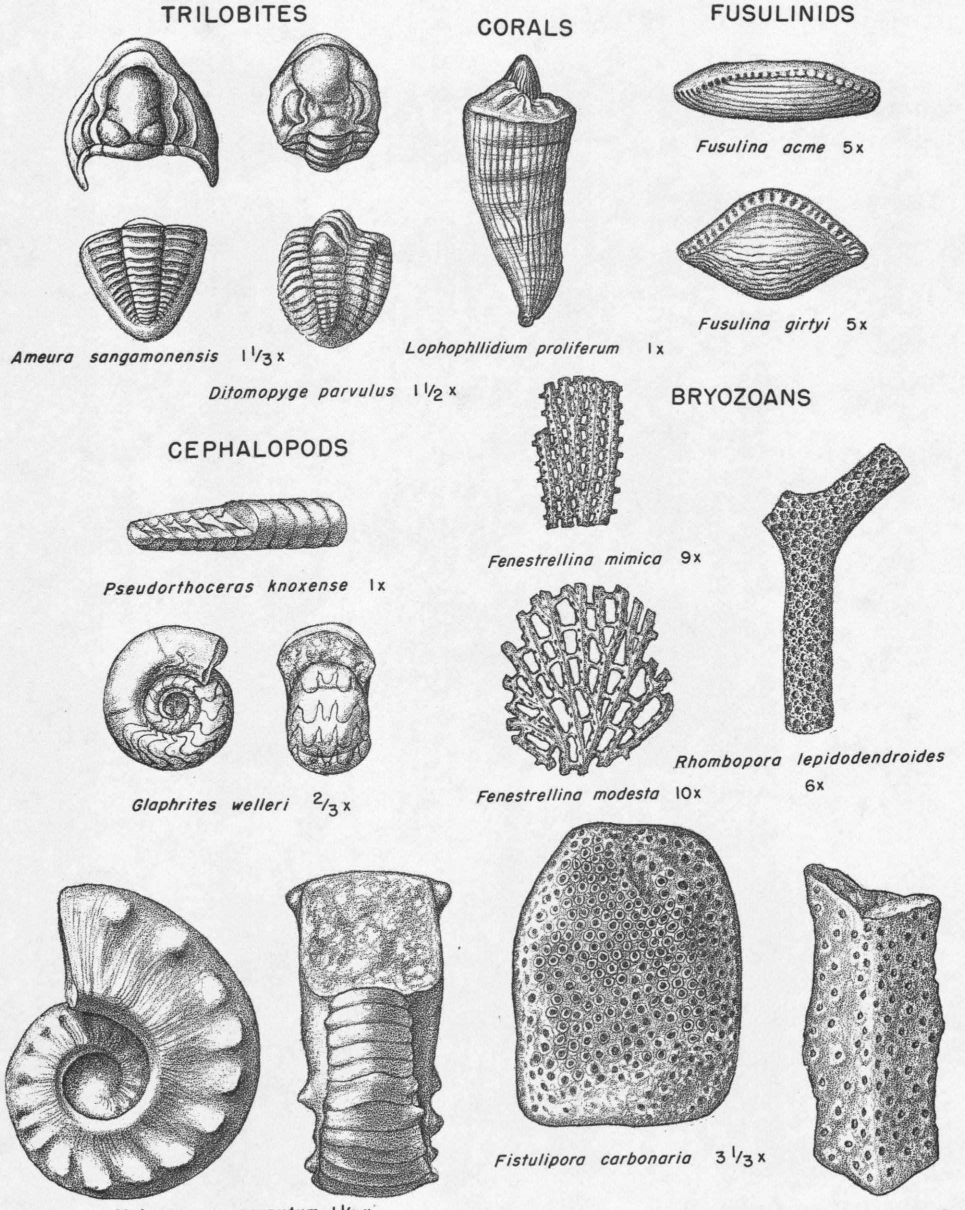


ILLINOIS STATE GEOLOGICAL SURVEY

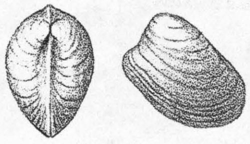
PHYSIOGRAPHIC DIVISIONS OF ILLINOIS

Reprinted 1970

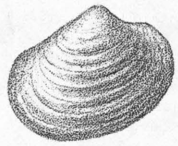



TRILOBITES
CORALS
FUSULINIDS
Fusulina acme 5x
Fusulina girtyi 5x
Ameura sangamonensis 1 1/3 x
Lophophllidium proliferum 1x
Ditomopyge parvulus 1 1/2 x
BRYOZOANS
CEPHALOPODS
Fenestrellina mimica 9x
Pseudorthoceras knoxense 1x
Rhombopora lepidodendroides 6x
Glaphrites welleri 2/3 x
Fenestrellina modesta 10x
Fistulipora carbonaria 3 1/3 x
Metacoceras cornutum 1 1/2 x
Prismopora triangulata 12x

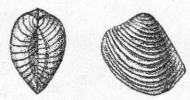
PELECYPODS



Nucula (Nuculopsis) girtyi 1x

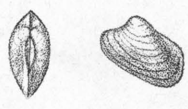


Edmonia ovata 2x

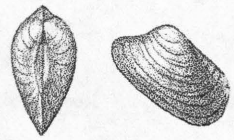


Astartella concentrica 1x

Dunbarella knighti 1½x

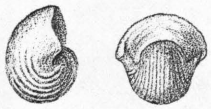


Cardiomorpha missouriensis "Type A" 1x

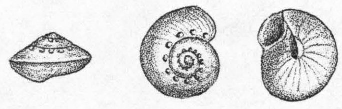


Cardiomorpha missouriensis "Type B" 1½x

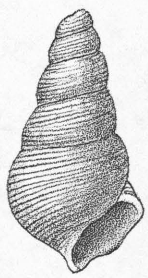
GASTROPODS



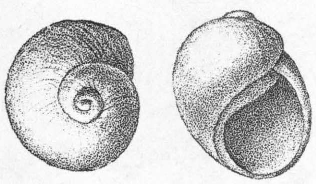
Euphemites carbonarius 1½x



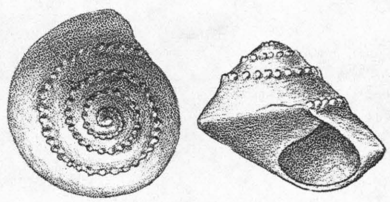
Trepospira illinoisensis 1½x



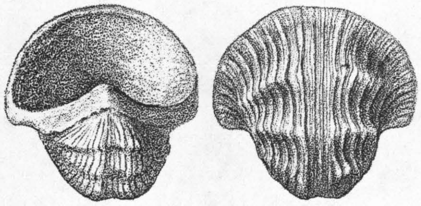
Donaldina robusta 8x



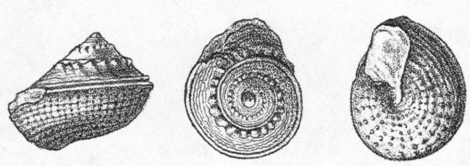
Naticopsis (Jedria) ventricosa 1½x



Trepospira sphaerulata 1x

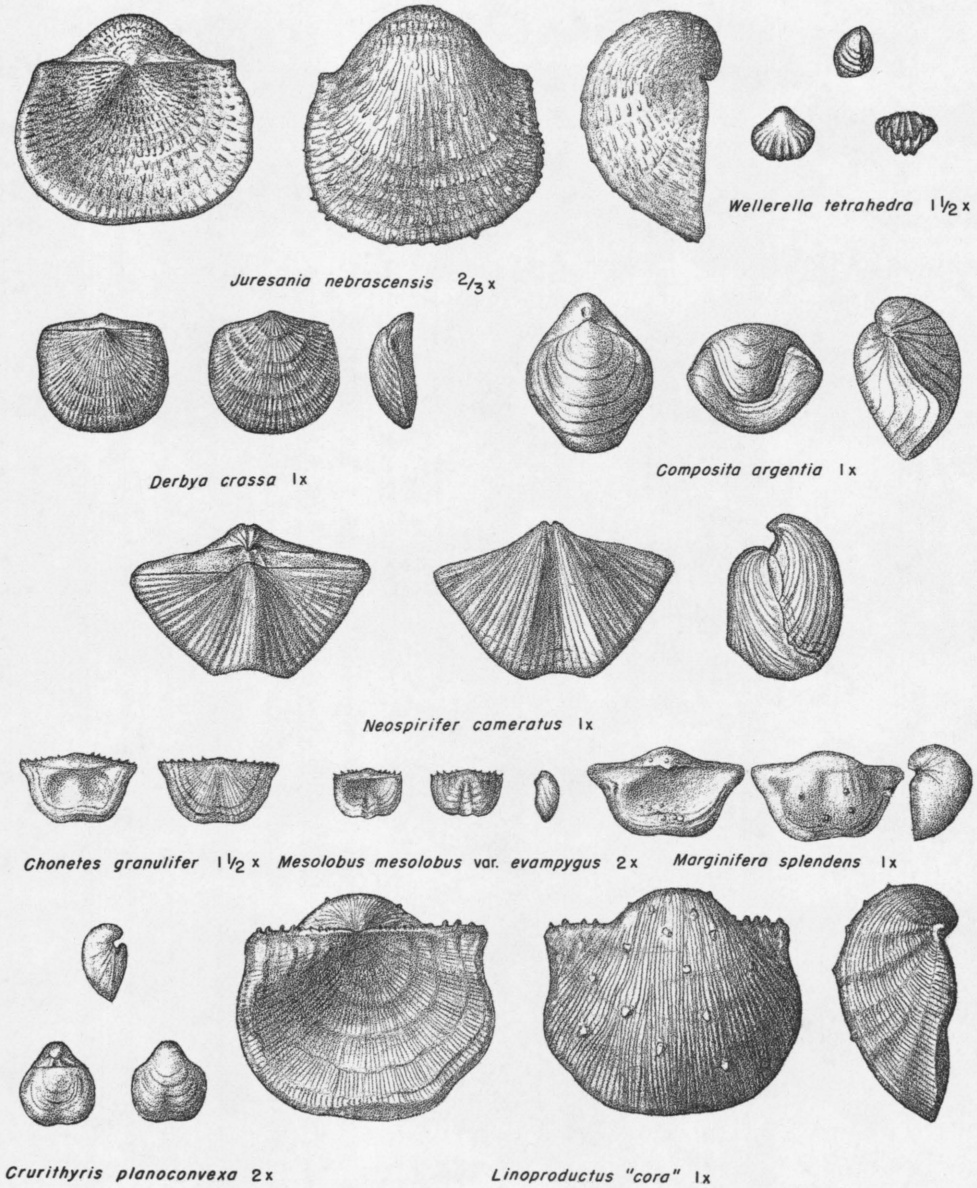


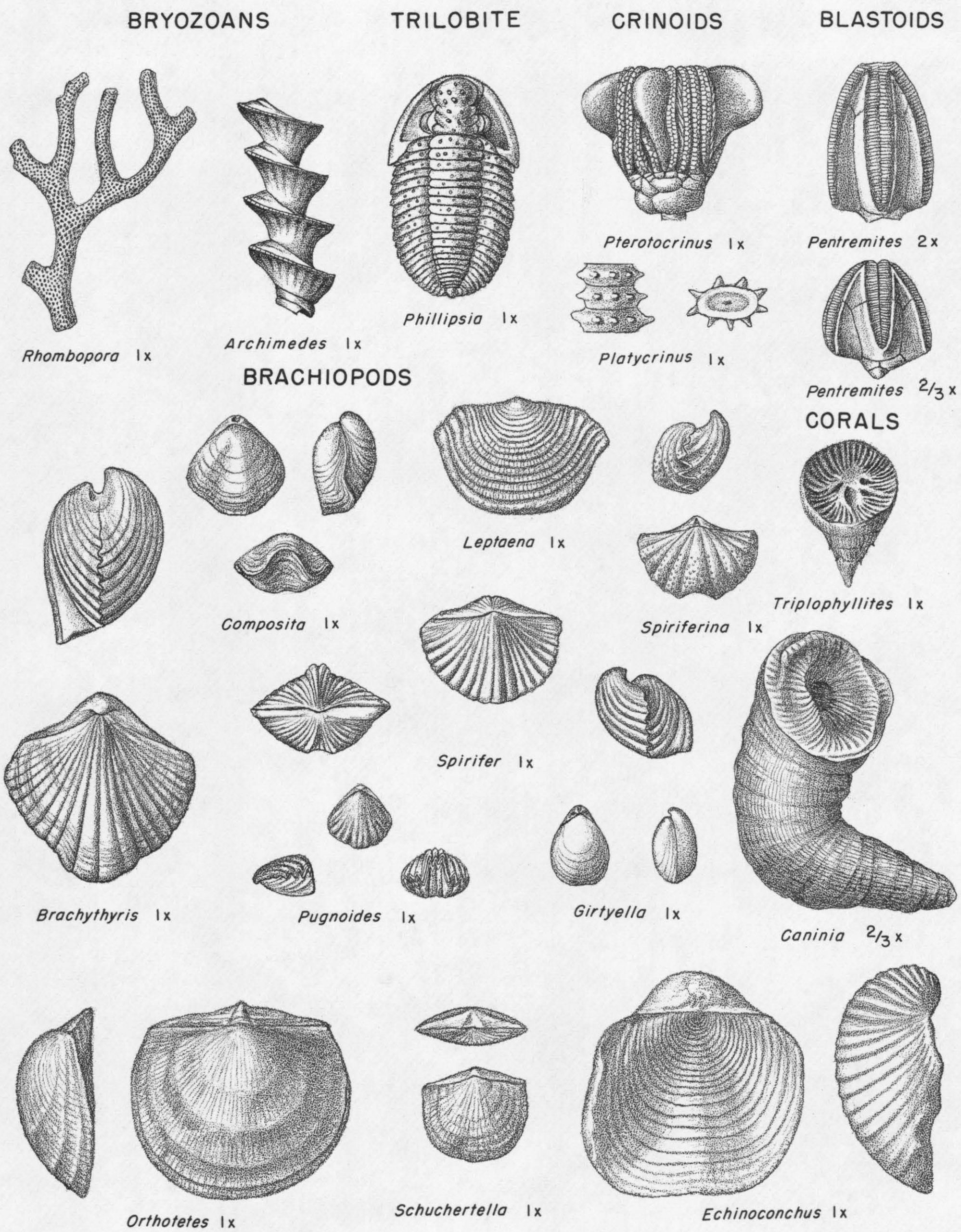
Knightites montfortianus 2x

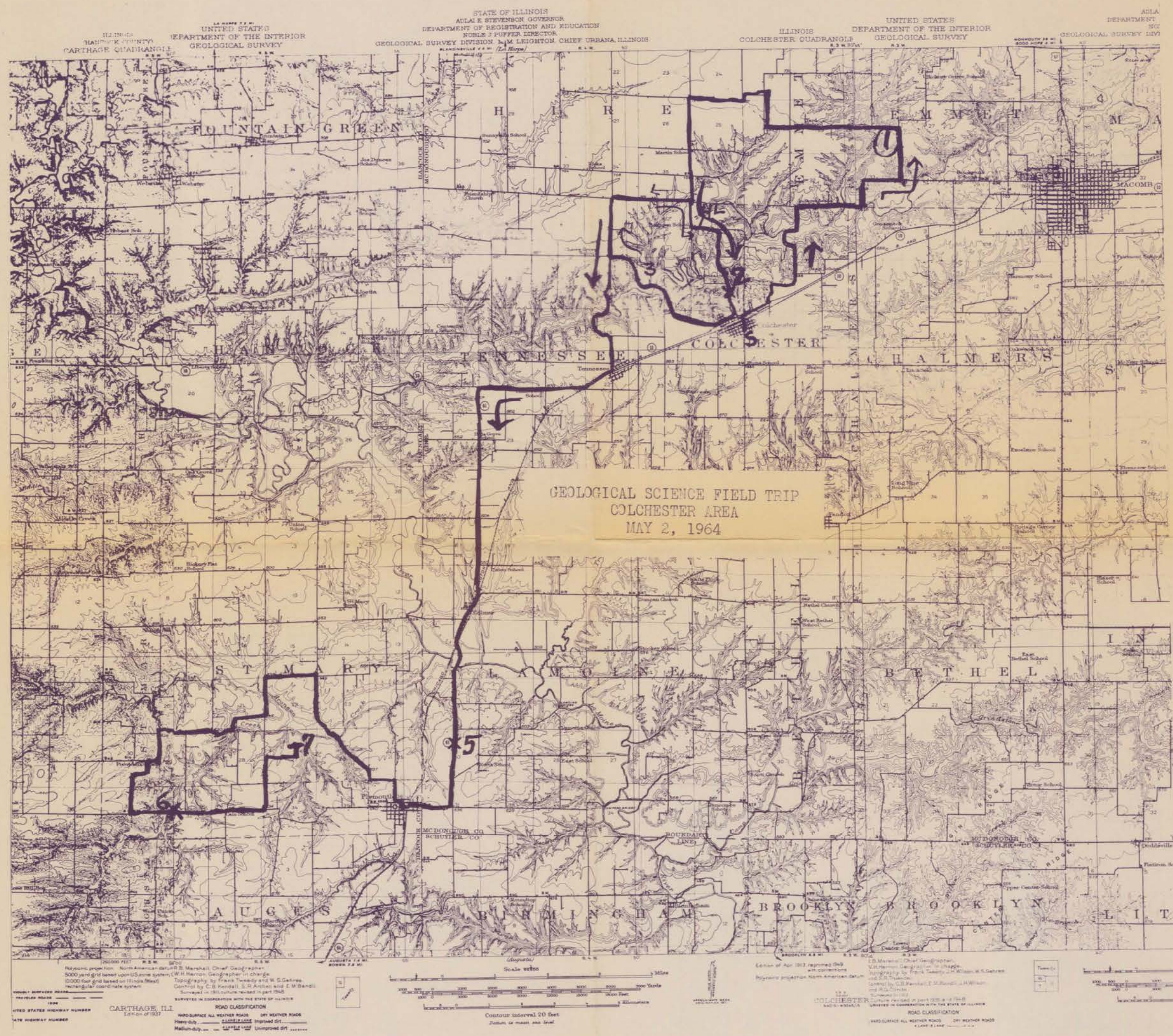


Glabrocingulum (Glabrocingulum) grayvillense 3x

BRACHIOPODS




BRYOZOANS
TRILOBITE
CRINOIDS
BLASTOIDS
Rhombopora 1x
Archimedes 1x
Phillipsia 1x
Pterotocrinus 1x
Platycrinus 1x
Pentremites 2x
Pentremites 2/3x
BRACHIOPODS
CORALS
Composita 1x
Leptaena 1x
Spiriferina 1x
Triplophyllites 1x
Spirifer 1x
Brachythyris 1x
Pugnoides 1x
Girtyella 1x
Caninia 2/3x
Orthotetes 1x
Schuchertella 1x
Echinoconchus 1x


GEOLOGICAL SCIENCE FIELD TRIP
COLCHESTER AREA
MAY 2, 1964
STATE OF ILLINOIS
ADLAI E. STEVENSON, GOVERNOR
DEPARTMENT OF REGISTRATION AND EDUCATION
NOBLE J. PUFFER, DIRECTOR
GEOLOGICAL SURVEY DIVISION, M. M. LEIGHTON, CHIEF, URBANA, ILLINOIS
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CARTHAGE QUADRANGLE
ILLINOIS
COLCHESTER QUADRANGLE
FOUNTAIN GREEN
HIRE
EMMET
MACOMB
TENNESSEE
COLCHESTER
CHALMERS
ST. MARY
LAMOINE
BETHEL
AUGUSTA
BIRMINGHAM
BROOKLYN
MCDONOUGH CO.
SCHUYLER CO.
Scale 1:62500
Contour interval 20 feet
Datum is mean sea level
ROAD CLASSIFICATION
CARTHAGE, ILL.
COLCHESTER
5
6
7